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EXAMINER	
FAN, CHIEH M	

ART UNIT	PAPER NUMBER
2638	

DATE MAILED: 09/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/975,682	HUANG, GANG	
	Examiner	Art Unit	
	Chieh M. Fan	2638	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 June 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18 and 23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,9-17 and 23* is/are rejected.

7)☒ Claim(s) *7 and 18* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 October 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 1-18 and 23 are objected to because of the following informalities: It is suggested changing every occurrence of the limitation "pre-coding matrix" to --- precoder --- so as to be consistent with the definition in the specification. In the instant application, a pre-coding matrix is referred to the matrix $\mathbf{P}(f)$ in equation 3 on page 7, line 17. On the other hand, it appears that the claimed "pre-coding matrix" is referred to $P_{ij}(f)$, which is called a "precoder" in the specification (see, e.g., page 10, line 18). Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-3, 6, 8-13, and 23 rejected under 35 U.S.C. 103(a) as being unpatentable over Ginis et al. (US 2003/0086514, "Ginis" hereinafter) in view of Schneider et al. (U.S. Patent No. 6,314,135, "Schneider" hereinafter).

Regarding claims 1 and 23, Ginis teaches a method for reducing cross-talk in a communications system comprising a plurality of transmitters (1410-1 through 1410-L in Fig. 14) for transmitting encoded data signals via respective communications channels, said method comprising the steps of: processing a first encoded data signal (tone 1 in Fig. 14) according to at least one pre-coding matrix (1420-1 through 1420-L) to produce a first pre-coded signal (output of 1410-1), each of said at least one pre-coding matrices having associated with it a respective encoded data signal (tone 1 through tone L); and communicating said first pre-coded signal to a respective first communication channel (1430 in Fig. 14), wherein said processing tending to offset channel impairments within said first communications channel (paragraph 0124, lines 5-8). Ginis does not particularly teach the step of adapting said at least one pre-coding matrix in response to an impairment indicative signal. Schneider teaches the step of adapting said at least one pre-coding matrix in response to an impairment indicative signal (lines 8-10 in abstract; also see 450-140-210 in Fig. 4) to compensate time-varying changes in the channel impairments (col. 1, lines 13-15). There, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the step of "adapting said at least one pre-coding matrix in response to an impairment indicative signal" into the method of Ginis so as to compensate time-varying changes in the channel impairments.

Regarding claim 2, Schneider teaches receiving said first pre-coded signal from said first communications channel; (430 in Fig. 4) and generating said impairment

indicative signal (output of 450 in Fig. 4) in response to a determination of a channel impairment level (462, 463 in Fig. 4) of said first communications channel.

Regarding claim 3, Schneider teaches the impairment indicative signal is determined according to a LMS algorithm (col. 5, line 66).

Regarding claim 6, Ginis teaches that the precoder may be initialized using a training mode (paragraph 0124, the last three lines). Schneider teaches that a initial training mode comprises the steps of propagating a pre-defined training sequence via said first communications channel; receiving said pre-defined training sequence from said first communications channel; and determining, using said received pre-defined training sequence, a channel impairment of said first communications channel (col. 1, lines 46-53; also see 273, 248, 246, 140 in Fig. 2).

Regarding claim 8, Ginis in view of Schneider teaches N transmitters, comprises N transmitters, where N is an integer, each of said N transmitters performing said steps of processing, communicating and adapting using respective encoded data signals (1410-1 through 1410-L and 1420-1 through 1420-L in Fig. 14 of Ginis).

Regarding claim 9, each of the N transmitters processes an encoded data signal according to N-1 pre-coding matrices (1420-2 through 1420-L in Fig. 14 of Ginis), each of said N-1 pre-coding matrices being associated with a respective encoded data signal (tone 2 through tone L in Fig. 14 of Ginis) from the other transmitters.

Regarding claim 10, said N transmitters processes an encoded data signal according to N pre-coding matrices (1420-1 through 1420-L in Fig. 14 of Ginis), each of

said N pre-coding matrices being associated with a respective encoded data signal (tone 1 through tone L in Fig. 14 of Ginis) from each of the N transmitters.

Regarding claim 11, Ginis teaches that the precoder may be initialized using a training mode (paragraph 0124, the last three lines). Schneider teaches that a initial training mode comprises the steps of propagating a pre-defined training sequence via said first communications channel; receiving said pre-defined training sequence from said first communications channel; and determining, using said received pre-defined training sequence, a channel impairment of said first communications channel (col. 1, lines 46-53; also see 273, 248, 246, 140 in Fig. 2).

Regarding claims 12 and 13, Schneider teaches the step of training an equalizer (246, 241 in Fig. 2) to reduce channel-specific impairments from said received pre-defined training sequence prior to selecting said initial matrix parameters.

4. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ginis et al. (US 2003/0086514, "Ginis" hereinafter) in view of Schneider et al. (U.S. Patent No. 6,314,135, "Schneider" hereinafter) as applied to claim 1 above, and further in view of Timm et al. (U.S. Patent No. 6,055,268, "Timm" hereinafter).

Ginis in view of Schneider teaches the claimed invention as applied to claim 1 above including the method is applied to a DSL system (paragraph 0003 of Ginis), but does not particularly teach a CAP signal or QAM signal. However, it is well known in the art that a DSL system may use a CAP signal or QAM signal. Timm teach a DSL system may use DMT, QAM or Cap signals (col. 3, lines 61-62 and 66-67). It would

have been obvious to a person of ordinary skill in the art at the time the invention was made to use a CAP signal or a QAM signal in the DSL system of Ginis in view of Schneider, since the use of a CAP signal or a QAM signal in a DSL system involves only routine skill in the art.

5. Claims 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ginis et al. (US 2003/0086514, "Ginis" hereinafter) in view of Timm et al. (U.S. Patent No. 6,055,268, "Timm" hereinafter) and Smee et al. (U.S. Patent No. 6,400,761, "Smee" hereinafter).

Regarding claim 14, Ginis teaches a method for reducing cross-talk in a DSL communications system (paragraph 0003) comprising a plurality of communications channels (1430 in Fig. 14), each communications channel propagating a respective signal, said method comprising: (a) processing at least one signal (tone 1 in Fig. 14) according to a respective pre-coding matrix (1420-1 in Fig. 14) to produce respective pre-coded signal; (b) communicating said at least one pre-coded signal via a respective communication channel (1430 in Fig. 14). Ginis does not teach (i) the at least one signal comprises in-phase (I) and quadrature (Q) signals; and (ii) the steps of (c) receiving, for each communicated pre-coded signal, data indicative of differences between transmitted and received signals; (d) adapting respective pre-coding matrices in response to respective received difference data; and (e) repeating steps (a) through (d) until said difference data associated with said at least one set of I and Q signals is less than a threshold difference level.

With respect to item (i), it is well known in the art that a DSL system may use a CAP signal or QAM signal (both have I and Q components). Timm teach a DSL system may use DMT, QAM or Cap signals (col. 3, lines 61-62 and 66-67). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a CAP signal or a QAM signal in the DSL system of Ginis, since the use of a CAP signal or a QAM signal in a DSL system involves only routine skill in the art.

With respect to item (ii), Smee teaches a method of compensating channel or system variations in order to improve performance of precoded communications system (col. 1, lines 12-15) comprising the step of (c) receiving, for each communicated pre-coded signal, data indicative of differences between transmitted and received signals (110 in Fig. 6, also see 46, 49 in Fig. 3); (d) adapting respective pre-coding matrices in response to respective received difference data (112 in Fig. 6); and (e) repeating steps (a) through (d) until said difference data associated with said at least one set of I and Q signals is less than a threshold difference level (see 114 loops back to 106 in Fig. 6, also see claim 5). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the method of Smee into the method of Ginis in view of Timm, so as to compensate channel or system variations and thereby to improve performance of the precoded communications system.

Regarding claim 15, Smee teaches that said data indicative of differences between transmitted and received signals comprises mean square error data (col. 5, line 33).

Regarding claims 16 and 17, as explained above in claim 14, the signal used in the DSL system may be a CAP signal or a QAM signal.

Allowable Subject Matter

6. Claims 7 and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

7. Applicant's arguments filed 6/30/05 have been fully considered but they are not persuasive.

The applicant's remark in page 16 through page 20 basically argues that *Ginis disassembles each encoded signal into its L component tones so that the tone component of an encoded signal can be distributed separately, one tone to each of the L precoders. This distribution is accomplished for each of the input encoded signals. See Ginis, FIG. 14 and para. [0122]. Each precoder receives as its input the same component tone from each encoded data signal. Ginis ultimately combines all the component tones for a particular encoded signal in the cross-couplings to each DMT transmitter. Ginis fails to teach that the precoder or precoding matrix is associated with a respective encoded data signal as taught and claimed by the applicant. For example,*

precoder 1420-1 in Ginis is actually associated with all L encoded data signals. The same is true for each other precoder shown in Ginis's FIG. 14.

Response --- The applicant is reminded that the examiner is entitled to give the broadest reasonable interpretation to the language of the claims. The claims only recite, "processing a first encoded data signal according to at least one pre-coding matrix to produce a first pre-coded signal, each of said at least one pre-coding matrix having associated with it a respective encoded data signal." In Ginis, each of the tone signals can be considered as an encoded signal. For example, at least the first signal of tone 1 can be considered as the first encoded signal. The second signal of tone 2 can be considered a second encoded signal, and so forth. As shown in Fig. 14 of Ginis, the at least one precoder 1420-1 processes the first signal of tone 1 and generate a first pre-coded signal (output of 1410-1) and the at least one precoder 1420-1 having associated with it a respective encoded signal tone 1. That is, the precoder 1420-1 never receives tone 2 through tone L.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chieh M. Fan whose telephone number is (571) 272-3042. The examiner can normally be reached on Monday-Friday 8:00AM-5:30PM, Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Vanderpuye can be reached on (571) 272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chieh M Fan
Primary Examiner
Art Unit 2638

September 12, 2005